# SET THEORY

## A DEFINITIONS

> **Definition Set**
>
> A **set** is a collection of objects, called elements.
> We list its elements between curly brackets.

**Ex:** List all possible results when rolling a standard die .

*Answer:* $E = \{1, 2, 3, 4, 5, 6\} = \{$  $\}$.

> **Definition Element**
>
> - An **element** is an object contained in a set.
> - $\in$ means "is an element of" or "belongs to".
> - $\notin$ means "is not an element of" or "does not belong to".

**Ex:** $2 \in \{1, 2, 3, 4, 5, 6\}$ and $7 \notin \{1, 2, 3, 4, 5, 6\}$.

> **Definition Equal sets**
>
> Two sets are **equal** if they have exactly the same elements.

**Ex:** Determine if the sets $\{2, 6, 4\}$ and $\{2, 4, 6\}$ are equal.

*Answer:* Yes, the sets $\{2, 6, 4\}$ and $\{2, 4, 6\}$ are equal because they contain the same elements: 2, 4, and 6.

**Ex:** Determine if the sets $\{1, 2, 3\}$ and $\{1, 2, 4\}$ are equal.

*Answer:* No, the sets $\{1, 2, 3\}$ and $\{1, 2, 4\}$ are not equal because element 3 belongs to $\{1, 2, 3\}$ but not to $\{1, 2, 4\}$.

## B CARDINALITY

> **Definition Cardinality**
>
> $n(A)$ denotes the number of elements in the set $A$.

**Ex:** $n(\{1, 2, 3, 4, 5, 6\}) = 6 =$ 

## C COMPLEMENT

> **Definition Universal set**
>
> A **universal set** is the set of all elements considered.

> **Definition Complement**
>
> The **complement** of a set $A$, denoted $A'$, consists of all elements in $U$ that are not in $A$. Sets $A$ and $A'$ are said to be **complementary**.

**Ex:** Given the universe $U = \{1, 2, 3, 4, 5, 6\}$ and the set $A = \{1, 3, 5\}$, find the complement $A'$.

*Answer:* Start with the universe $U = \{1, 2, 3, 4, 5, 6\}$.
The set $A = \{1, 3, 5\}$ includes 1, 3, and 5.
The complement $A'$ is all the elements in $U$ that are not in $A$:

$$A' = \{2, 4, 6\}$$